

VIRGIN ISLANDS AGRICULTURAL EXPERIMENT STATION

ST. CROIX, VIRGIN ISLANDS, U. S. A.

**Under the supervision of the
UNITED STATES DEPARTMENT OF AGRICULTURE**

**REPORT OF
THE VIRGIN ISLANDS AGRICULTURAL
EXPERIMENT STATION**

1924



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**VIRGIN ISLANDS AGRICULTURAL EXPERIMENT STATION,
ST. CROIX**

[Under the supervision of the Office of Experiment Stations, United States Department
of Agriculture]

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REPORT OF THE DIRECTOR

By J. B. THOMPSON

From the standpoint of the planter and gardener, weather conditions in the Virgin Islands during the year ended June 30, 1924, were a decided improvement over those of the three previous years. The annual rainfall recorded at the station was 35.44 inches, which, though still below normal, was approximately 7 inches in excess of the total precipitation for the preceding year. The comparatively heavy rains in September and October stimulated cane planting, resulting in a considerable extension of the area under cultivation. The rainfall was not sufficient for the production of optimum yields of cane but was adequate for carrying the plantings through the season in fairly good condition.

The severe drought of 1920 to 1923, inclusive, caused heavy losses to sugar planters. During this period modifications of the local system of agriculture to meet the situation were suggested to plantation owners. In some instances growing more cotton was recommended, in others raising sisal and other dry-weather crops was suggested; and not infrequently the use of a more diversified system of dry farming was advocated. In this connection, however, it should be borne in mind that other factors than the mere ability of a crop to thrive enter into the question of its practical and profitable cultivation. Scarcity and expensiveness of labor, coupled with the isolated position of the islands and the difficulty involved in marketing crops are other matters to be reckoned with. The experiment

station advocates the cultivation of food crops in such quantities as can be absorbed by the local market, and emphasizes the desirability of practicing a more diversified crop system than is now employed. However, any change in the general system of agriculture as now practiced should be gradual and progressive rather than revolutionary in character, because of the large amount of capital which has been invested in sugarcane growing equipment.

In the animal husbandry division of the station crosses are being made between the native cattle and an introduced Holstein bull in the hope of developing a breed having the high milking qualities of the Holsteins. Milk-production records of the station herd during one lactation period were kept. Experiments with 50 representative pullets from various local sources were started to ascertain the relative weights of both native fowls and eggs and the egg-laying tendencies of the hens, and trap-nest records are being kept.

In the agronomy division various field crops were tested and plantings of the common and hairy Peruvian varieties of alfalfa were made. A number of sugarcane seedlings are being tried with a view to the possible production of a commercial variety yielding large crops under dry-weather conditions. Paper mulch is being experimented with to determine its value for moisture conservation in cane soil. About 25,000 plants, the greater part of which were sweet potato cuttings, were distributed during the year by the agronomist.

Horticultural activities included tests of garden vegetables, pineapple experiments, and orchard, arboretum, reforestation, and plant-breeding work. A study was also made of transportation and marketing problems incidental to the proposed growing of vegetables for the winter trade on the mainland. Approximately 550 packages of seed and 23,000 plants were distributed to 1,188 persons during the year.

STATION IMPROVEMENTS

During the year a reservoir having a capacity of 67,837 gallons was constructed to receive the flow from the galvanized corrugated iron catchment area completed the latter part of the previous year. A 4-inch pipe connects this basin with an old reservoir having a capacity of 43,000 gallons, and conducts the surplus water for storage to reservoirs in the lower yard.

Since the problem of water storage is of great importance to practically every planter in St. Croix, a statement showing in detail the dimensions, capacity, and specifications of the new reservoir is here given:

TABLE 1.—*Dimensions, capacity, and specifications of the new reservoir*

Dimensions:	
Length (inside measurement).....	42½ feet.
Width (inside measurement).....	17½ feet.
Depth (inside measurement).....	12¼ feet.
Capacity.....	67,837 gallons.
Excluding supporting pillars.....	9,045 cubic feet.
Specifications:	
Bottom thickness (concrete extending under walls).....	½ foot.
Walls, thickness (stone masonry).....	1¼ feet.
Top thickness (reinforced concrete).....	5 inches.
Pillars (12 concrete, to support top).....	8 by 8 inches.
Surfacing inside walls and bottom (hard cement).....	1 inch.

The following were the general items of cost of constructing the new reservoir:

TABLE 2.—General items of cost of constructing the 67,837-gallon reservoir

Labor and hauling:	
Masonry and concrete work (on contract)	\$200. 00
Excavating	145. 00
Constructing forms by carpenter	19. 38
Bending and fitting iron by blacksmith	5. 00
Bailing water, etc.	8. 80
Quarrying stone for walls	10. 00
Carting (plantation carts, \$1 per day)	38. 00
Breaking stone (220 barrels, at 7 cents each)	15. 40
Delivering sand (612 barrels, at 20 cents each)	122. 40
Cost of labor and hauling	563. 98
Material:	
Cement (partly delivered), 78 barrels	325. 50
Lumber for forms (40 per cent of cost)	45. 76
Lime (delivered on ground), 210 barrels	94. 50
Iron and barbed wire for reinforcing	43. 66
Staples and nails	1. 10
Cost of material	510. 52
Cost of labor and hauling	563. 98
Total	¹ 1, 074. 50

¹ Equivalent to \$1,033.17 in United States currency.

A cistern having a capacity of 20,000 gallons was completed during the year. Water from this cistern will also be conducted through connecting pipes to the reservoir in the lower yard. With these additions the total water-storage capacity for station purposes is approximately 155,000 gallons. This, however, is still inadequate for carrying on plant-breeding and propagation work. A 2-inch pipe line was laid to carry water to a section of the experimental plats.

A house 50 feet long was erected to provide a shelter for the movable equipment of the horticultural division and for the cane and cotton investigations. It contains a small room for storing tools and a large room for sheltering carts, cultivators, plows, and other large field implements.

A poultry building was moved from near the plant propagation house to a hillside where chickens can roam at will without likelihood of their interfering with experimental plantings. The house, constructed some years ago, has been enlarged and remodeled and is now equipped with trap nests, feed hoppers, a coop for broody fowls, and roosts which can be moved to permit of cleaning the dropping boards underneath.

ANIMAL HUSBANDRY

CATTLE

The improved weather conditions resulted in the production of an abundance of green fodder and grasses, and the station herd in general maintained a better condition of flesh than it did during the period of drought. Milk records of the station herd of native cows were continued.

In January, 1924, the station purchased from the animal husbandry department of Cornell University a 4-months-old Milking Shorthorn

bull, sired by Glenside Dairy Chief, 882629, out of Lady Clay 21st, 893195, whose milk record as a 2-year-old was 7,644 pounds. The imported calf became heavily infested with ticks soon after his arrival and has never been entirely free from them since. However, it is thought that he has now acquired immunity to tick fever. The calf was in thrifty condition at the close of the year, having made a gain of 87 pounds during the 30-day period from May 31 to June 30. (Fig. 1.)

A bull calf of Guernsey breeding (fifteen-sixteenths grade Guernsey) was transferred from the Porto Rico Agricultural Experiment Station in January, and remained in vigorous condition throughout the year, weighing at the age of 8 months, 390 pounds. (Fig. 2.)

The grade Holstein bull, which was introduced several years ago from St. Kitts, has been in service exclusively at the station during the past two years. Seven of his get, of which six are heifers, were born during the year.

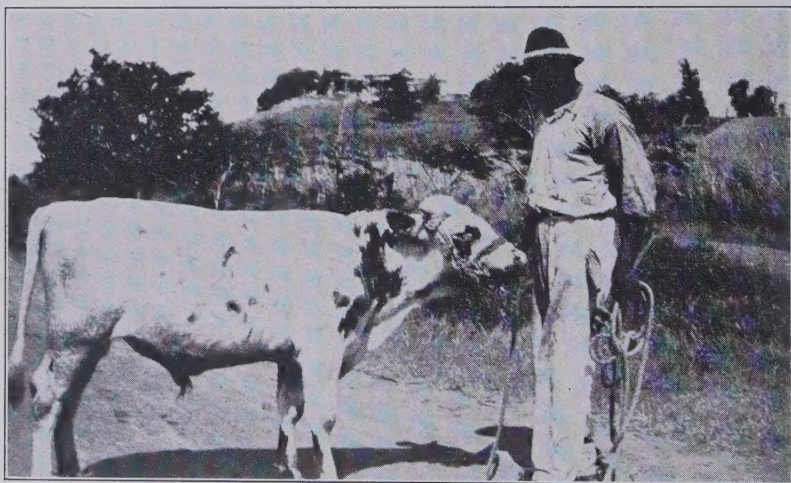


FIG. 1.—Registered Milking Shorthorn bull calf

POULTRY

During the closing months of the year 50 representative native pullets were procured from various sources for the purpose of obtaining data on relative body weights, annual egg production, and weight of eggs. The birds were banded and trap-nest records of egg production were accurately kept. The flock received a commercial scratch feed supplemented with dry mash in addition to having free access to the open range. However, the ration was deficient in animal protein as it contained no form of meat scrap. Body weights were taken after the hens completed a 100-day laying test, beginning March 10. After laying 22 eggs, the lightest hen weighed 1 pound 14 ounces, and the heaviest bird 4 pounds 1 ounce. The average weight of all the birds was 2 pounds 13 ounces, and an average of 24.1 eggs was obtained from the flock. The best trap-nest record

for 100 days was 56 eggs, and the poorest was 8. The average weight of all the eggs laid was 41.1 grams, which is equivalent to 17.45 ounces per dozen. The average weight of the largest eggs laid by any hen was 53.8 grams or 22.68 ounces per dozen. The lightest average weight of eggs produced by any hen was 34.8 grams, or 14.76 ounces per dozen. It is thus apparent that the native hens are small, even when compared with the smaller utility breeds of the States, and that the eggs are likewise small. The native chickens are also exceedingly variable in type, 47 of the lot tested having single combs and the others rose combs. Fully 22 per cent of the flock were crested fowls. Another interesting observation was the occurrence of five toes on 7 hens of a lot of 58 that were examined.



FIG. 2.—Bull calf (fifteen-sixteenths grade Guernsey)

BEEKEEPING

In an effort to develop beekeeping on the island, preliminary steps were taken to start a small modernly-equipped apiary at the station. Three 3-frame nuclei were introduced from the Porto Rico Experiment Station early in March. One of the nuclei with a tested queen was lost soon after its arrival. Of the other two, one has done remarkably well, the other rather indifferently. The bees are of pure Italian strain.

AGRONOMIC INVESTIGATIONS

LEGUMES

Several varieties of field beans were tested during the year, but with only partial success, owing to dry weather immediately following planting. The crops made good growth, but produced a poor quality of beans, many of which failed to mature. The inoculation of seed of five varieties with pure cultures of nitrogen-gathering bacteria failed to give any increase in yield. Several kinds of Bonavist beans (*Dolichos lablab*), including a bush form, were tested, as in previous years, and proved their adaptability to dry-weather con-

ditions. As a cover crop, the bush form seems to be worthless, producing a sparse vegetative growth. It may be of value, however, for breeding a type adapted to this purpose. Plantings of mung beans (*Phaseolus aureus*) made a fairly good vegetative growth, but failed to produce satisfactory yields even after they were inoculated with a commercial culture. A number of the young, immature pods showed a tendency to drop after setting. This bean, which is practically unknown in St. Croix, made a vigorous growth on the Golden Grove plantation.

The common blue wis or butterfly pea (*Clitoria ternatea*) was grown to study its behavior under cultivation. Its value as a forage crop, its strikingly vigorous growth in the wild state, and its success as a competitor with other species, recommend it for trial under cultivation. That the plant has good seeding habits is shown by the fact that it is still producing after yielding in the first harvest at the rate of 880 pounds of seed per acre. After a growing period of 9½ months the plant has a more vigorous appearance than ever.

Observing the growth made by vetch (*Cracca cathartica*) under dry, uncultivated conditions in St. Kitts, seeds of the plant were gathered for trial at the station in St. Croix. The first planting was made in December and showed satisfactory growth, producing an abundance of seed.

SUNN HEMP

A planting of sunn hemp (*Crotalaria juncea*), made in December, grew splendidly and produced a profusion of showy yellow flowers. Owing, however, to some unknown cause, sunn hemp does not seed well in St. Croix.

ALFALFA

Small plantings of common and hairy Peruvian varieties of alfalfa, made on adjacent areas for comparative purposes, were unusually successful. (Fig. 3.) However, the hairy Peruvian showed a marked superiority over the ordinary sort. This variety is still vigorous and the stand unimpaired after eight months of growth during comparatively dry weather.

SWEET POTATO WORK

During the year an experiment was made to learn whether the effect of manuring the soil was apparent in the yield of sweet potatoes as a second crop. The plat reserved for the crop had been treated with manure at the rate of 20 tons per acre in 1922, and then planted with tomatoes, the last crop of which was harvested in April, 1923. In September this area and an adjoining similar unmanured plat were plowed and planted with the sweet potato varieties Black Rock, Key West, and Big Wig. At the end of five months the crops from both plats were harvested. The yields are given in Table 3.

TABLE 3.—Yields of sweet potatoes grown as a second crop on manured and unmanured plats

Variety	Yield per plat		Estimated yield per acre	
	Ma-nured	Unma-nured	Ma-nured	Unma-nured
Black Rock.....	<i>Pounds</i> 51	<i>Pounds</i> 121 $\frac{1}{4}$	<i>Pounds</i> 1,973	<i>Pounds</i> 4,612
Key West.....	156	265	6,037	10,255
Big Wig.....	94	209	3,638	8,088

As the table shows, the yields of the unmanured plats greatly exceeded those of the manured plats. These results correspond with results obtained in former experiments conducted at the station but

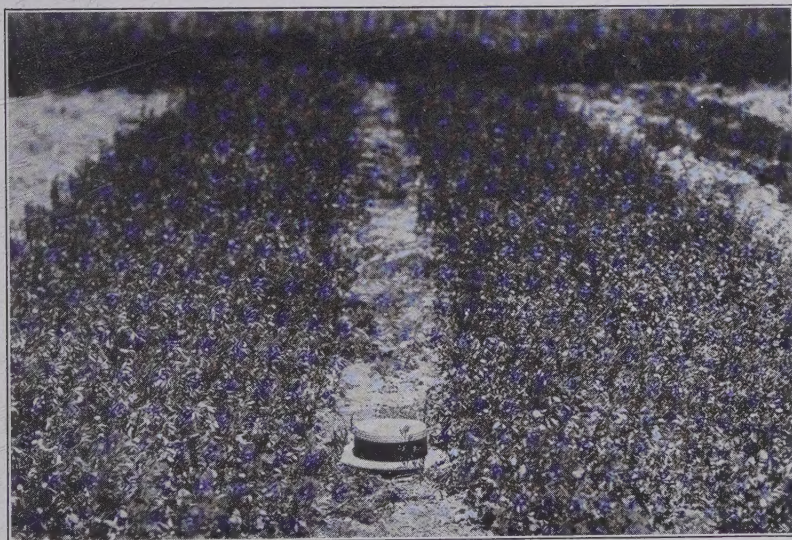


FIG. 3.—Hairy Peruvian alfalfa on left, common alfalfa on right

may not hold for all soil types. It has been observed in all the experiments that manure has a tendency to increase vine growth but to decrease yield of roots.

To determine the most economical method of planting sweet potatoes, cuttings of the Black Rock variety were set at different distances in rows 4 feet apart. This variety is a vining form and is about the average in vigor and rankness of growth. Each plat was 12 by 50 feet in dimensions and contained rows of plantings set 12, 18, and 24 inches, respectively, in the row. Data obtained from seven replicated plats showed that the heaviest yields were from 12-inch spacings, and that there was a decrease of 14.5 per cent in weight and an increase of 22.3 per cent in size of roots in plantings at 18-inch intervals. Plantings at intervals of 24 inches in the row

yielded 15.9 per cent less in weight than those at 12-inch intervals and showed an increase of 52.4 per cent in size of root. Table 4 shows the yields in pounds and number of roots corresponding with the different distances of planting.

TABLE 4.—*Yields of sweet potatoes planted at different distances in the row*

Plat number	12-inch intervals		18-inch intervals		24-inch intervals	
	Weight	Roots	Weight	Roots	Weight	Roots
	Pounds	Number	Pounds	Number	Pounds	Number
1.....	84	285	75	203	72	158
2.....	79	299	68	195	67½	146
3.....	83	274	65	175	80½	176
4.....	87	230	65	159	71	140
5.....	87½	265	76¾	204	69½	153
6.....	82	227	83¼	170	61	146
7.....	74½	226	60	155	63½	140
Average.....	82.4	258	70.4	180	69.3	151

In the work of improving the sweet potato, over 250 seedling varieties were grown in a comparative test, each seedling being checked against its parent variety. Of this number 45 varieties produced heavier yields than did the parents. Many of the seedlings are of good quality and some are very promising. On the other hand, some are apparently worthless for all practical purposes. At the close of the year about half the seedlings were discarded as having no special value and a comparatively large quantity of seeds was collected for the purpose of propagating other varieties.

COCONUTS

The 365 coconut trees which were planted at the station in 1916 continued to develop satisfactorily and grow persistently notwithstanding the prolonged period of drought. The planting occupies an area of 9 acres, and has been long in coming into bearing, some of the trees now carrying their first crop.

HERBARIUM

The botanical survey work which was begun the previous year was continued. Approximately 800 specimens of St. Croix flora have been collected to date. It is estimated that the herbarium now contains specimens of 60 to 65 per cent of all the flowering plants on the island, most of which have been mounted upon standard herbarium sheets and labeled. In connection with the work of making determinations, grateful acknowledgment is due to Dr. N. L. Britton, director of the New York Botanical Garden, who carefully studied the collection.

WEATHER OBSERVATIONS

Table 5 briefly summarizes the meteorological data collected by the station during the year.

TABLE 5.—*Condensed meteorological data for the fiscal year 1924*

Month	Temperature		Total precipitation	Monthly evaporation	Average daily velocity of the wind
	Average daily maximum	Average daily minimum			
1923					
July.....	88.6	74.9	1.28	8.491	67.2
August.....	88.3	74.9	2.77	7.569	63.0
September.....	88.1	73.7	5.26	7.371	47.3
October.....	86.2	73.1	8.49	7.252	39.9
November.....	85.8	70.3	4.31	5.521	16.5
December.....	83.2	69.7	1.78	5.551	44.7
1924					
January.....	83.5	70.0	1.99	5.747	54.7
February.....	82.0	69.0	3.52	5.017	43.0
March.....	84.0	68.0	0.42	6.818	35.2
April.....	86.6	71.0	1.19	7.559	35.3
May.....	87.9	73.6	2.27	7.911	49.2
June.....	88.0	74.0	2.16	6.992	50.5
Total.....			35.44	81.799	

The maximum temperature for the year was 91° F., which was registered August 13 and August 16, and again September 6. The minimum temperature, 58° F., was recorded December 4. The heaviest rain for the 24-hour period, 4.25 inches, fell October 16, and the heaviest wind occurred September 14, the velocity for the 24-hour period being 123 miles.

REPORT OF THE HORTICULTURIST

By W. M. PERRY

EXPERIMENTS WITH TRUCK CROPS

TOMATOES

Comparative test of the varieties Stone, Golden Beauty, Duke of York, June Pink, Ponderosa, Bonny Best, and Chalk's Early Jewel gave inconclusive results. To determine the effect of staking, these varieties were grown on a staked area of 900 feet square, the plants being pruned to two main stems. An area of similar size was planted with unstaked plants. Staking resulted in an increase of 476 fruits. There was some loss of fruits on the staked plants owing to decay following injury from sun scald. When the cost of staking and pruning is considered, it is doubtful whether the practice can be recommended.

STRING BEANS

The varieties Kentucky Wonder, McCaslan Pole, and White Seeded Kentucky Wonder were grown on plats each measuring 550 square feet during a period of dry weather. Of the three varieties, Kentucky Wonder remained green the longest and produced a yield of 4 pounds in excess of McCaslan Pole, its nearest competitor. White Seeded Kentucky Wonder was least productive. A planting of six varieties of snap beans of the bush type failed because of

the setting in of heavy rains just after planting, followed by very dry weather. Refugee, or Thousand-to-one, grown under similar weather conditions, was a partial success.

LIMA BEANS

Three plats were planted with Lima beans in August, two being devoted to the Florida Butter bean, and the third to the Small White Lima (Carolina Sieva). The former again surpassed the latter in yield of beans and in its ability to resist drought. In a continuous selection and breeding experiment, having for its object the elimination of the dark mottled color of the Florida Butter bean, a single plant bearing beans showing comparatively little color was selected for further planting, the seeds of each pod being sown in separate hills. Of the plants produced, one bore seed which was almost entirely free from the objectionable mottling.

EGGPLANT

When planted on adjacent plats and given similar treatment, Long Purple yielded at the rate of 30,833 fruits per acre, Black Beauty, 26,126 fruits, and New York Improved Spineless, 18,465 fruits. The fruits of Long Purple, although greatest in number, were smaller, unattractive in appearance, and of inferior keeping quality. Black Beauty showed marked superiority over the other varieties.

PEPPERS

All varieties of peppers can be successfully grown at the station and seem to be comparatively free from disease and insect attack. During the year Pimiento, Ruby King, and Bullnose were grown for comparative purposes. Ruby King proved to be the most productive of the three, yielding at the rate of 15,862 pounds per acre. Pimiento produced at the rate of 14,073 pounds per acre, and Bullnose, 13,203 pounds.

ONIONS

Experiments begun in January, 1924, with a complete commercial fertilizer and farmyard manure for Bermuda onions, showed that a 4:8:6 mixture composed of dried blood, acid phosphate, and muriate of potash, applied in advance of planting at the rate of 500 pounds per acre, increased the yield more than manure applied at the rate of 6.5 tons per acre. Each row was 50 feet long. Plat 1, which received the commercial fertilizer, yielded on the average 23.4 pounds per row; plat 2, receiving manure, 22.1 pounds; and plat 3, which was given no treatment and served as a control, 7.3 pounds. These results indicate the need of fertilizer for this soil for the best onion production. Individual bulbs from the crop weighed over a pound. The onions remained in good condition when stored in an airy room for two months.

CARROTS

In tests of four varieties of carrots on one-forty-third acre plats, New York market yielded 97 pounds; Coreless, 86; Chantenay, 58; Oxheart, 53; Intermediate, 47; and French Forcing, 25. The per-

centage of germination was similar for all varieties. Dry weather during the growing season may have been responsible for the wide variation in yield, some of the varieties doubtlessly being better able than others to withstand drought.

YAM AND TARO

Seven varieties of yam (*Dioscorea* spp.) were received from the Porto Rico Experiment Station during the year. All are making excellent growth. A locally grown variety known as Sealtop was also planted.

Two varieties of taro (*Colocasia esculenta*) are being grown, and two plants of Queensland arrowroot (*Canna edulis*), recently planted, look very promising.

MELONS AND OTHER CUCURBITS

The successful cultivation of melons and other cucurbits is rendered rather difficult by the persistent attacks of insect pests, including the melon worm (*Diaphania hyalinata*), the melon aphid (*Aphis gossypii*), and a plant bug (*Phthia picta*). In many cases weekly sprayings are necessary to protect the developing crop. The spraying outfit should be provided with a curved connection between the nozzle and the extension rod to permit of underspraying the foliage. Both the melon worm and the melon aphid feed on the under side of the leaf. The melon worm was controlled by spraying the leaves with a combination of lead arsenate and Bordeaux mixture, prepared according to the 4:4:50 formula. The melon aphid was held in check with kerosene emulsion, the stock solution of which should be diluted 1 part to 12 parts water before using. The ravages of the plant bug were checked by means of poison bait. A ripe tomato into which corrosive sublimate had been injected was placed on each melon hill, where it was readily eaten by the bug and also by troublesome crickets.

Watermelons.—Nineteen hills of the Tom Watson variety of watermelon were grown from seed which had been imported from the mainland. (Fig. 4.) Farmyard manure at the rate of $1\frac{2}{3}$ gallons was placed in each hill before planting and well mixed with the soil. The vines grew rapidly and were given weekly sprayings with Bordeaux mixture for the control of fungus diseases. The planting yielded a total of 57 melons, which was at the rate of 1,000 per acre. The melons weighed an average of 23.5 pounds. One melon, when crated and shipped to New York, arrived in good condition.

Muskmelons.—Fruits of excellent quality were obtained from a locally grown variety of muskmelon. Owing to the destruction of part of this crop by dogs, complete records of production are not available. Another very promising lot of muskmelons is being grown in a more protected place for the production of seed for further planting at the station and for distribution.

Cucumbers.—During the year six varieties of pickling cucumbers were tested at the station at the request of a Long Island pickling company, which is interested in the possibilities of growing the crop on a commercial scale in St. Croix. Owing to the late arrival

of the seed, planting was not made until February, during the advancing dry season, and there was only 2.19 inches of rainfall for the crop during its growing season. Of all the varieties under test, the Chicago pickling cucumber made the heaviest yield, producing at the rate of 21,705 fruits per acre. A sample jar of the fruit of each variety was prepared in brine and shipped to the Long Island company for examination. It is planned to repeat the experiment during a more favorable season.

Chayote (Chayote edulis).—Three varieties of chayote were introduced from Porto Rico during the year. One variety bears long green prickly fruits, another has smooth green fruits, and the third has small, ivory-colored fruits. The long green prickly type was the most productive of the three, yielding a total of 80 fruits, with an aggregate of 22.7 pounds from the six plants grown.



FIG. 4.—Tom Watson watermelons

The chayote, like other members of the cucurbit family, is susceptible to certain fungus diseases and should be sprayed to assure its successful culture. A fence or specially constructed trellis should be provided for the vines to climb upon. The fruit has a squash-like though delicate flavor and makes a delicious dish when properly prepared.

Squash.—Hubbard squash yielded at the rate of 1,000 fruits per acre, with an average weight of 6.8 pounds per fruit. White Bush or Pattypan produced at the rate of 2,176 fruits per acre, with an average weight of 1.7 pounds each.

ORCHARD WORK

The experimental orchard contains plantings of oranges, grapefruit, avocados, figs, lemons, mangoes, peaches, limes, pomegranates, olives, grapes, papayas, guavas, and bananas. It is well located,

but unfortunately the area is strongly calcareous, being underlain by marl formation, and the soil is poorly adapted to some classes of fruit. Generous applications of humus-forming organic matter have been partly effective in overcoming the adverse condition of this soil.

CITRUS

To determine the efficiency of dried blood, acid phosphate, and muriate of potash for citrus, different combinations of these materials were applied to the trees planted last year. Applications of fertilizer mixtures containing nitrogen gave uniformly more vigorous growth than the use of combinations lacking in this element. All the orange trees under experiment are of the Indian River variety, and the grapefruit trees are of the Duncan variety.

Trees which were heavily infested with the purple scale (*Lepidosaphes beckii*) were effectively sprayed with a lubricating-oil emulsion, as recommended by the Porto Rico Experiment Station.¹

LIMES

A lime orchard, established some years ago at the station, becoming seriously affected by scale during the year, was completely renovated, the trees being pruned and sprayed with a lubricating-oil emulsion, and a heavy crop of jack beans grown and plowed under to improve the soil.



FIG. 5.—Green Ischia fig, nine months after transplanting

FIGS

Two trees each of the varieties Celeste, Brown Turkey, Ischia (Green Ischia), Brunswick, and Lemon were transplanted to the orchard in September, 1923. The first three varieties are making excellent growth; but Brunswick and Lemon, which were planted on the less productive soils of the western side of the orchard, are developing slowly. An individual plant of Green Ischia now measures 5½ feet in height and 2½ inches in diameter at the base

¹ Porto Rico Agr. Expt. Sta. Circ. 17, p. 11.

(fig. 5), while plants of Celeste, Brown Turkey, and Green Ischia are bearing young, immature fruits. A small fig tree which was planted some years ago at the station bore a crop of 60 fine fruits in December and a second crop of 47 fruits the following May.

PAPAYAS

Plants of Hawaiian papayas were set in 30-foot spaces between the yet small but more permanent orchard trees. Three interesting in-



FIG. 6.—Hawaiian papaya bearing 101 fruits on trunk and five branches

dividuals have been selected from the relatively large number of fruiting trees in the orchard for breeding work. One of these bears handsome fruit which is ovoid in shape, has a small seed cavity, and ripens slowly after beginning to color. It is thought to be representative of an ideal shipping type. Another of the selected trees is highly productive and has distinct branching habits. This tree has borne as many as 101 fruits on its trunk and five lateral branches. The ripe fruit averaged $4\frac{1}{2}$ pounds in weight. The third selection bears two or three fruits in the axil of each leaf, and peduncles which are sufficiently long to prevent excessive crowding of the fruit. (Fig. 6.)

Bordeaux mixture, applied in strengths of 4:4:50, 5:5:50, and 6:6:50, was used for the control of a fungus disease which caused the leaves to die and the fruit to decay. The more dilute form of the mixture seemed as efficacious in controlling the disease as did the most concentrated form.

ROSELLE

Roselle (*Hibiscus sabdariffa*), seeded in October, was a failure, the resulting plants attaining a height of only a few inches before reaching maturity. A second planting, made in May, 1924, is promising. In view of recent investigations indicating an important relation between the amount of daylight and the blooming period of plants, it is suggested that in the case of the roselle planted in October the period of short daylight followed planting so closely as to prevent full development.

PINEAPPLES

Although pineapples thrive in some sections of St. Croix, it is questionable whether they can be successfully grown at the station where the soil is highly calcareous and is underlain by marl at a depth of 15 to 18 inches. With a view to obtaining definite data on the growth of pineapples on such soils, the horticulturist planted four plats with 60 slips each in September, 1923, protecting two of the plats with a paper mulch. As was to be expected, the plants made poor growth, became chlorotic and stunted, and in some cases died. The plants vary in growth, however, which suggests the possibility of developing a strain showing more than average tolerance to calcareous soil.

COVER CROPS

Among the legumes tested for use as cover crops in the orchard were the Florida beggarweed, jack beans, and pigeon peas. Pigeon peas made the most efficient cover crop, lasting for a longer period and affording a better wind protection to the small trees by reason of its erect growth and abundant branching.

ARBORETUM

The arboretum, which was started near the close of the fiscal year 1923, now contains 50 different species, most of which have been introduced from other parts of the world. Of this number, 17 species have been classified as fruits, 10 as ornamentals, and 14 as timber. Nine others have been grouped among miscellaneous plants of economic value. Eucalyptus trees (*E. rostrata* and *E. tereticornis*) are attracting considerable attention as a result of their rapid growth under dry-weather conditions. A specimen tree of *E. rostrata*, which was 18 inches high when set in the arboretum, made a growth of over 7 feet in less than a year after transplanting.

REFORESTATION

Six hundred seedlings of the common West Indian mahogany (*Swietenia mahoganii*) were transferred from the seed bed to the hill in the rear of the horticulturist's residence. Further plantings will be made as seedlings become available for the purpose. It is intended to include in the planting a belt of Honduras mahogany (*Swietenia macrophylla*), the seedlings of which have made more rapid progress than those of *S. mahoganii* growing in the arboretum. Seedlings of *Eucalyptus rostrata* and *E. tereticornis* are being grown for inclusion in the reforestation project.

QUICK METHOD OF PLANTING MAHOGANY SEEDLINGS

During the year the horticulturist devised a method whereby seedlings can be rapidly and accurately set at uniform distances in the field. A one-fourth-inch line, to which conspicuous strings are tied at intervals of 6 feet, is stretched lengthwise the field to form a row, and stakes are driven 6 feet apart across the end of the field at right angles with the line. As soon as the seedlings in the first row are planted the line is moved to the next stake, being stretched as before. A measuring rod is used to give the proper distance at the farther end of the line. Planting is done by two men, one of

whom carries a bundle of seedlings to be set out and the other a pickax to make the holes. The broad end of the ax is sunk into the ground about 3 inches from the line, opposite the marking string, so as to open the ground directly back of the blade. A seedling is then placed in the hole, and another stroke of the ax fills the hole and firms the dirt about it.

EXTENSION ACTIVITIES

Agricultural extension work in St. Thomas was successfully continued in cooperation with the Department of Education. During the year labor-union officials very kindly permitted the use of their land at Mosquito Bay for carrying on garden-vegetable demonstrations; and through the activities of the horticulturist, who is also extension assistant, pineapple plantings were made at Mosquito Bay, Bonne Esperance, Bovoni, and Neltje Bjerg, island of St. Thomas, on the property of E. A. Moorehead, Crux Bay, island of St. John, and on the Diamond & Ruby, Spring Gut, Bonne Esperance, La Grange, and Hogensborg plantations, island of St. Croix. Assistance was also given in the planting of 10,000 pineapple plants at Butlers Bay, St. Croix.

Extension activities in St. Thomas have aroused considerable interest, and similar activities should be extended to cover all outlying districts of the three islands.

REPORT OF THE AGRONOMIST

By MAYBIN S. BAKER

THE SUGAR INDUSTRY IN ST. CROIX

The sugar industry of the Virgin Islands had its inception in a grant of the King of Denmark in 1671 authorizing the old Danish West Indies Sugar Factory Co. to take possession of the island of St. Thomas and other adjoining uninhabited islands for the purpose of raising sugarcane. Finding, after a period of years, that cane could not be profitably grown in St. Thomas, owing to the hilly and rough contour of the island and unfavorable climatic conditions, the company transferred its holdings to St. Croix, which had been purchased by Denmark from France in 1733. The infant industry developed rapidly until in 1796 there were 259 plantations owning and operating mills, some of which were driven by windmill power and others by animal power. The cane was crushed between vertical wooden rollers and the juice evaporated in a battery of open kettles. The thick sirup was allowed to crystallize in coolers and then run into molds where the molasses was drained off. These old mills did inefficient work in extracting the sugar as compared with modernly equipped sugar factories.

The first island mill to be operated by steam power was erected on the Hogensborg plantation in 1816. Forty similar mills were in operation in 1852, about which time beet sugar entered the market as a competitor of cane sugar. The price of the latter declined as a result, and the sugar industry of St. Croix ceased to be profitable under the then prevailing system. The first central factory, now the St. Croix Sugar Factory, was erected about 1877 near the town of Christiansted, and handled the cane crops from many neighbor-

ing plantations, giving an impetus to cane cultivation by reason of its efficiency. Later came the Bethlehem plantation factory, now the property of the Danish West Indies Sugar Factory Co., and finally with the erection of the La Grange Factory at Frederiksted, the central factory system was extended to all remaining cane-producing areas.

The total area available for cane growing was approximately 20,000 acres, but the actual area under cultivation has been considerably reduced within recent years on account of dry weather and unsettled labor conditions. Approximately 16,500 tons of sugar would have been produced annually by the crops grown during the 31-year period 1777 to 1807, inclusive, had not a quantity of cane been converted into rum. During this period the area under cultivation was approximately 22,000 acres and the quantity of sugar produced per acre amounted to 0.75 ton. The annual average yield of sugar for the period from 1835 to 1897, inclusive, was 12,028 tons, assuming that all the crop was manufactured into sugar. The average area under cultivation for the period was 18,000 acres, each of which yielded on the average about 0.664 ton of sugar. More recent figures show an average annual production of 9,486 tons of sugar for the island between 1898 and 1919. This came from an average of 14,230 acres, each of which produced 0.666 ton. The figures for the 116-year period show little change in the average sugar yield per acre, but a distinct reduction in the total production. Decline in production is due to the abandonment of some of the higher and less productive lands, leaving for use the small areas of productive soil. Other conditions remaining unchanged, this elimination of some of the less productive areas should have resulted in an increased average yield.

With the adoption of modern facilities the mills are said to have extracted from each ton of cane twice the amount of sugar formerly recovered. Assuming this statement to be true, the quantity of cane yielding at the rate of 0.75 ton per acre in the mills of the 1777 to 1807 period would yield 1.5 tons per acre if milled with the equipment of the 1898 to 1919 period. This would seem to indicate an actual decrease of over 50 per cent in production between the earlier and later periods, due very likely to soil depletion resulting from the practice of the single-crop system.

The quantity and value of sugar exported from St. Croix between the years 1920 and 1924, inclusive, are shown in Table 6.

TABLE 6.—Quantity and value of sugar exported from St. Croix during the period 1920 to 1924, inclusive

Year	Tons ¹	Value
1920.....	8,812.5	\$2,759,634.37
1921.....	6,637.6	1,817,706.76
1922.....	6,305.6	552,496.67
1923.....	5,280.3	618,798.35
1924.....	2,425.0	

¹ These figures include the sugar equivalent of the comparatively small quantity of rum exported during these years. It is calculated that the amount of cane required to make 1 gallon of rum would have yielded 12½ pounds of sugar had it been converted into this product.

² These approximate figures were obtained from the mills and represent production rather than exports.

BREEDING WORK

The cane-breeding work of the station has been seriously affected by the severe drought of the past three years. Many seedlings of the 1922 and 1923 series are being grown, and some are showing good field characters. Losses from both series have been heavy, however, due to lack of rainfall. All the seedlings of the 1923 series and the greater number of the 1922 series are the progeny of cane S. C. 12/4. It is planned to continue the breeding work in the hope of eventually establishing a good commercial sort producing good yields under dry-weather conditions.



FIG. 7.—Sugarcane, six months after planting. Plat at left with paper mulch, at right no mulch

CULTURAL EXPERIMENTS

In November, 1923, an experiment was begun to determine the effect of paper mulch on soil moisture conservation and yield of cane. The use of a heavy paper as a mulch was developed in Hawaii first as a means for controlling weeds in cane fields, but later it was applied to other crops and conditions. One grade of paper made in strips 36 inches wide is being compared with two grades of paper each 18 inches wide, and all are being checked against a plat of cane grown without paper mulch and in accordance with local practice. The crop which is being treated with paper mulch is tillering much more freely and making manifestly better growth than the control area. (Fig. 7.) A comparison of the increase in cost of production with the value of the increase in yield will determine whether or not the practice of using paper mulch is to be commended.

A test was begun in November to ascertain the effects on yield of cane of deep plowing and frequent surface cultivations to conserve soil moisture and improve seed-bed conditions, plantings being made in furrows between "banks" (fig. 8), to conform with methods ordinarily practiced and to permit of comparison with plantings on leveled surfaces.

Other experiments either under way or proposed include a spacing test to learn the effect on yield of planting at different distances, growing crops in rotation on cane land, and testing cane to determine the influence of maturity and sucrose content upon growth of cuttings. The standard varieties Crystallina and Ribbon, and seedling cane S. C. 12/4 are being compared in these tests with some 50 or more varieties which were introduced from other countries and propagated during the year.



FIG. 8.--St. Croix "bank method" of planting cane

In connection with the work of introducing cane varieties, the station is taking every precaution to prevent the importation of serious cane diseases. Cane growing as a commercial industry in the Virgin Islands is confined to the island of St. Croix. A sugarcane quarantine station has been established in St. Thomas, where cane importations are kept under observation until it is felt they are free from disease and can be safely transferred to St. Croix. The crop is now comparatively free from disease, the mosaic disease, at one time reported from St. Croix, not having been observed for several years.

COTTON

Cotton investigations were suspended in 1921 with the adoption of a closed season for the suppression of the pink bollworm (*Pectinophora gossypiella*). Notwithstanding the closed season for nearly two years prior to planting, the crop of 1923 was practically destroyed by the pest. Seed for the planting had been imported from Barbados, and although it had been subjected to fumigation in Barbados, it evidently contained living larvæ at the time of its introduction. A relatively small area was planted to cotton by various planters late in the season of 1923.

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